- Failure to communicate...
- No demonstrable understanding of the standards and traditions of biomedical science...
- Failure to comprehend responsibilities to the academic community.
- Neglect of evidence, unfounded assumptions, and attribution of malice.
- Failure to appreciate the health implications [of the research in question]...
- Failure to comply with federal regulations...
- Failure to honor MSU rules...."

Although the panel members are eager to discuss the report, they are following instructions from Pierre to remain silent. MSU officials and professors contacted by *Science* also said that they were obliged to await final resolution of the case, which may not come any time soon, for a decision by MSU can be appealed to HHS for final review. Williams says he is vindicated by the Mishkin panel's report, while ElKassaby failed to return a phone message left for her.

However, Zolton Ferency, a prominent civil liberties attorney representing ElKassaby, was willing to make a statement on his client's behalf. He denounced the whole proceeding as "ridiculous." It was, he said, based on "false" and "irresponsible" charges brought by Williams. Ferency points out that MSU has no quarrel with the student, so if the Mishkin panel's interpretation of scientific misconduct differs from MSU's, he asks, "Why should the graduate student be made to suffer?"

The question presents the issues confronting the university and federal ethics overseers in stark terms: Which interpretation of scientific misconduct is right—the university's or the reviewing panel's? And what should happen to a graduate student who gets caught in the middle?

For now, there are no answers. Pierre told *Science* that MSU is working on a response to the Mishkin report "expeditiously," and that a decision on its recommendations will come soon.

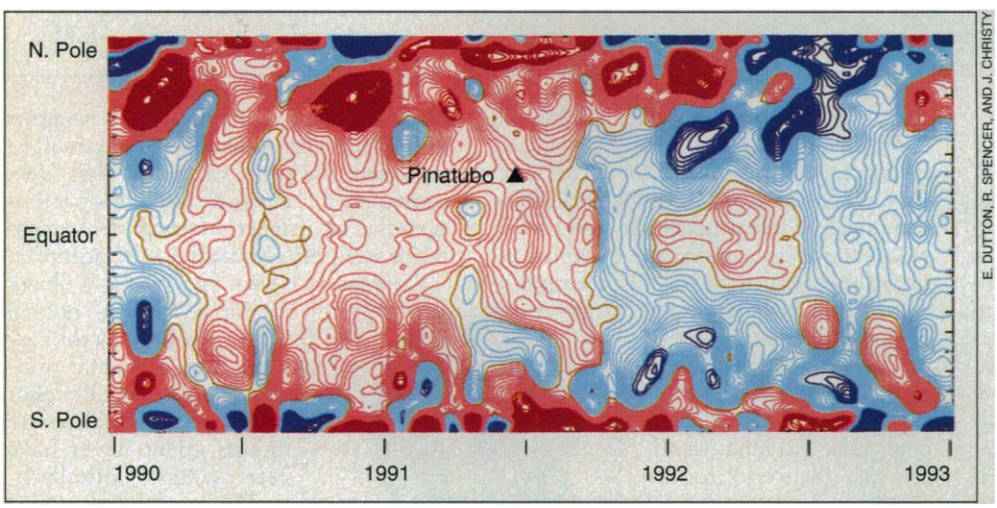
–Eliot Marshall

CLIMATOLOGY

Pinatubo Global Cooling on Target

Jim Hansen is on a roll. First, the climate researcher who heads the National Aeronautics and Space Administration's Goddard Institute for Space Studies made a bet that the annual global temperature would reach a new record high sometime during the first 3 years of the 1990s. The culprit, Hansen believed, would be greenhouse warming. He won that wager after the first year (*Science*, 18 January 1991, p. 274). Then, when the Philippine volcano Pinatubo blasted millions of tons of debris into the stratosphere in June 1991, Hansen used his computer climate model to predict that the shade cast by the debris would cool the globe by about half a degree Centigrade. Lo and behold, year-end temperature reports for 1992 are now showing that he was again on the money—dramatically confirming scientists' tentative belief that volcanoes can temporarily cool the climate and validating at least one component of the computer models predicting a greenhouse warming.

From the start, Pinatubo looked like a good prospect for testing climate theory. It lofted 25 to 30 million tons of sulfur dioxide gas, which turns into a long-lasting haze of sulfuric acid droplets. That probably made its sun-blocking aerosol cloud the most massive since Krakatau's in 1883. So Hansen cranked up his sophisticated computer model, estimated how much sunlight the Pinatubo aerosol cloud would eventually block, and came up with his prediction of a 0.5°C temperature drop—enough to set the globe back to the cool days of the early 1960s, albeit for only a few months.



A sudden chill. Temperatures measured by NOAA satellites clearly show the cooling *(blue)* that set in a few months after the eruption of Mt. Pinatubo as well as El Niño's 1992 equatorial warming.

Those few months of chill did indeed appear in the latter half of last year. A record compiled by Hansen and his Goddard colleague Helene Wilson shows that an irregular, year-long decline of global surface temperatures bottomed out at about 0.6°C below the average of the year before Pinatubo. As dramatically displayed in satellite-measured temperatures of the lowermost part of the atmosphere (see figure), the cooling set in rapidly at low latitudes and was only briefly impeded by a countervailing warming trend caused by El Niño early in 1992. "The last half of the year was pretty much right on our calculations of what Pinatubo would do," says Hansen. Such a clear example of a posteruption cooling should dispel any lingering doubts about the power of volcanoes to change climate, he notes.

The cooling is also "an interesting test of the short-run physics" of climate models that predict greenhouse warming, says modeler Michael MacCracken of Lawrence Livermore National Laboratory. However, it is not a complete test. "You don't say the model is proven just because it reproduced the volcanic effects," he cautions. Greenhouse warming involves both short-term responses of the sort involved in volcanic cooling and long-term responses, such as a loss of highly reflective sea ice that further warms the climate by increasing the absorption of solar energy. Volcanic cooling is too short-lived to trigger such feedbacks, MacCracken notes.

That's one reason why few scientists are yet ready to accept Hansen's third contention, that greenhouse warming will become obvious to all in the next few years, once the climate system recovers from Pinatubo. In contrast, most climatologists believe that Hansen's success in calling for record warmth in the early '90s could have been blind luck and that it will be at least early in the next century before the greenhouse effect leaves an unequivocal signature in the temperature records. But the way is already clearing for a test of Hansen's third prediction. The tropical stratosphere is already nearly free of volcanic aerosol, says Larry L. Stowe of the National Oceanic and Atmospheric Administration in Camp Springs, Maryland, who monitors aerosols by satellite. And, he says, Pinatubo's influence should have faded from the rest of the globe by the end of the year.

–Richard A. Kerr